matter, and drawing it towards other particles, is capable of conversion into a repelling force.

A body, half of whose mass has had its attracting tendency converted into a repelling tendency, will have a specific gravity of zero, and if placed in a vacuum will neither rise nor fall.

If more than half the mass of a body has had its attracting tendency converted into a repelling tendency, it will rise into the air, and, passing the limits of the atmosphere, will continue moving away from the earth with a velocity for a time accelerated by terrestrial repulsion, but tending more and more towards uniformity as it proceeds.

The "flying machine" was constructed of a substance that had undergone such a conversion. By means of a regulator the resultant of the attracting and repelling tendencies could be turned in any direction, and so the velocity of the machine could be increased or diminished *ad libitum*.

It was in this machine that Mr. Stranger made his journey to the planet Mars, and the work mainly deals with Martian history, the customs of the inhabitants, and adventures and incidents *en route*. The two satellites of Mars were met, and their diameters, distance from their primary, and period of revolution are supposed to have been approximately measured by the adventurer. Having reached the planet in safety, a long description is given of the startling difference one would observe on attempting to walk upon a globe where the surface gravity was only three-eighths that of the earth.

The Marsians, Martians, or Marticoli, as Prof. Young would call the inhabitants of our ruddy brother, were, according to the author, living very happily under a form of Socialism; and food was almost as free and plentiful among them as the air which they breathed, because they had learnt to manufacture it from its chemical elements—oxygen, hydrogen, carbon, and nitrogen—which existed in abundance on their planet as on the earth. In this Utopia, not only were electric lights in every house and street, and the phonograph an instrument in common use, but the sound-figures drawn upon the revolving cylinder were used as the representation of speech, such characters being truly phonetic. It appears strange, however, that although the Martians had attained such a high degree of civilization, yet they had no knowledge of gunpowder or any explosive whatever, or of any kind of telescope, a circumstance which seems contrary to our ideas on the evolution of inventions.

The inhabitants of Mars were supposed to have come from the earth, and their transference was effected in the following manner. A sun, accompanied by satellites, in revolving at an immense distance round a larger sun passed very near to Mars and the earth, and caused them to approach one another. In the words of the writer, "The common centre of gravity of the four bodies must have been so situated as to have almost neutralized the resultant of the attraction of the earth and Mars towards their respective centres, so that on one part of the earth's surface the attraction of Mars would overcome that of the earth, and gently and slowly draw a body from its surface to its own; while in other parts the attraction of the earth would be more powerful and prevent this. The two planets must also have been so near that their atmospheres were mingled, and hence the transference did not result in the death of those who had thus to emigrate against their will."

Such an explanation as this, of some perplexing phenomena, shows an intimate knowledge of the laws of gravitation. Again, whilst on a visit to one of the small Martian satellites, a fragment of rock was broken off, and instead of at once falling down on the ground, as it would have done on the earth or Mars, it sailed slowly and gracefully away, until it came in contact with another rock several yards off, when it descended softly and gently to the ground with the motion of a falling flake of snow in a perfect calm—an imaginary incident in perfect accordance with the laws of gravitation. Many similar incidents are just as ably treated, and the description of a meteor is worth repeating here:—"Its general shape was globular, and before we had got close to it, it seemed a perfect sphere, but at this near distance it looked like a round mass of incandescent liquid covered all over with bubbling and boiling protuberances, which every now and then emitted huge jets of flaming gas, or, detaching themselves from the general mass, shot forth as globules of white shining liquid. We were, in fact, the spectators of the early formation of a little world, a sun in miniature, but resembling the sun rather as it was many ages ago than as it is now."

We might quote many other descriptions of phenomena all agreeing with acknowledged facts and rigid scientific principles. We refer to observations of the extreme blackness of the shadows cast by the rocks of the Martian satellite which was supposed to have been visited, the noiseless explosions of the meteor above described, the apparent motionlessness in space of the flying machine, in spite of its enormous velocity, the inferior attraction of Mars and its satellites, and the explanation of how men got transferred from the earth to Mars. Indeed, the work is as interesting to us as to the general reader, and as a means of disseminating scientific knowledge may be eminently useful.

R. A. GREGORY.

OUR BOOK SHELF.

The Uses of Plants: a Manual of Economic Botany, with special reference to Vegetable Products introduced during the last Fifty Years. By G. S. Boulger, F.L.S., F.G.S. (London: Roper and Drowley, 1889.)

THAT a good manual of economic botany is really wanted no one who knows anything of the subject will deny, and pending the appearance of a satisfactory book any contributions towards such an end must be accepted with thanks, always supposing that those contributions are trustworthy and intelligible. Articles by competent writers on the various products of the vegetable kingdom are to be found in encyclopædias, and occasionally special subjects are taken up and worked out by individual writers; but the great want is a thoroughly good book treating of the whole range of economic plants.

The little book before us, which comprises 224 pages, is not one that will help to such a desirable end.

The plan adopted by the author, of classifying the products under distinct heads, is undoubtedly the best; but it is not equally carried out in all parts of the work. Although, under "Food, Food Stuffs, and Food Adjuncts," we find the products divided under different sections, as starches, sugars, roots, fruits, &c., no attempt has

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been made to classify the individual plants mentioned under each head, whether alphabetical or scientific, while those under materia medica, oils and oil-seeds, gums and resins, are placed in some sort of scientific classification of the natural orders. Nor is the produce of one plant, though of a similar character, always to be found in the same paragraph. Thus, on p. 40, under roots and tubers, the introduction and importance of the potato are referred to, then comes a paragraph on each of the following: sweet potato, yams, Jerusalem artichokes, turnip, carrot, parsnip, beetroot, onion, parsnip-chervil, salsafy, and radish; and then, on p. 43, we have another paragraph referring to the potato, especially to the disease and the recent introductions of *Solanum maglia* and *S. Commersoni*, which would have been better placed with the account of the potato on p. 41.

On p. 59 the Souari nut (*Caryocar nuciferum*) is printed *Somari* nut, and said to be Camelliaceous. Though it is closely allied to the Camellia, it would have been more correct to call it a Ternstrœmiaceous plant. It is, however, for the meagre character of the information generally that the book is unsatisfactory. The following examples, taken haphazard, will illustrate our meaning:—

"The Coriander, the whole fruit of *Coriandrum sativum*, L., is cultivated to a small extent in Essex, but is obtained mainly from the Mediterranean and from India."

"The fruits of Angelica (*Angelica Archangelica*, L.) are used in Chartreuse, and the leaf-stalks are candied as a sweetmeat" (pp. 66–67).

Also at pp. 160–61, under "Dyes and Tanning Materials," we find the following:—"Betel Nut (*Areca Catechu*, L.) is recommended by Mr. Christy." "Canaigre is the root of the Texan Dock (*Rumex hymenosepalus*, Torrey), recommended by Mr. Christy."

"Mimosa extract was sent from Australia as early as 1823, but dropped out of notice till recently. In 1880 we imported £682,296 worth of various bark extracts" (p. 161).

Though the book is stated to have "special reference to vegetable products introduced during the last fifty years," very few dates of introduction are given, and a large number of the plants referred to were known and valued before the present century.

Examination of Water for Sanitary and Technical Purposes. By Henry Leffmann, M.D., Ph.D., and William Beam, M.A. (Philadelphia: P. Blakiston, Son, and Co., 1889.)

This volume contains a great deal of clearly stated information in its 106 pages. The authors have succeeded in the endeavour expressed in their preface to select trustworthy and practical processes, and to exclude the description of methods not generally employed, with other matters only remotely connected with the subject. So far as organic matter in water is immediately concerned, the "albuminoid ammonia" and the "oxygen-consuming power" are relied upon by the authors. Special prominence is also given to the estimation of chlorine, nitrogen as nitrates and as nitrites (by colorimetric processes), phosphates, dissolved oxygen, and poisonous metals. A general method of quantitative analysis for technical purposes follows, including the estimation of hardness alkalimetrically, after Hehner—rejecting soap solution altogether—and the estimation of boric acid, after Gooch, as well as the constituents that invariably receive attention. A carefully compiled chapter on the interpretation of results, and a few other matters, complete the volume.

Celestial Motions: A Handy Book of Astronomy. By William Thynne Lynn, F.R.A.S. Sixth Edition. (London: Edward Stanford, 1889.)

This is the sixth edition of an interesting little book, which explains briefly the principal facts relating to the motions of celestial bodies, and to the dimensions of those belonging to our own system. The information has been brought up to date, and an addition of a chapter on "The Calendar" has been made. In the chapter on the sun we are told that "the solar spots are produced by tearings open of some of the luminous envelopes which surround the sun, so that we see in them to a depth below that of the solar surface." To an ordinary reader this statement would be rather misleading, since no mention is made of the absorption of the sun's light by the descent of the cooler particles on to the solar surface from the upper regions of its atmosphere, the spots thus being made to appear dark and not bright. In chapter x. a short reference is made to the refraction, propagation, and aberration of light, while in chapter xii. we have a brief sketch of the history of astronomical discovery. The book concludes with an explanation of astronomical and technical terms.

Science Examination Papers. Part I. Inorganic Chemistry. By R. Elliot Steel, M.A., F.C.S. (London: George Bell and Sons, 1889.)

This work, intended for teachers, consists of a series of examination papers arranged in a progressive and logical order. It is divided into two parts, theoretical and practical, and is written, as the author tells us, "not as a cram-book, but as a means of testing the student's knowledge and progress." The first part treats of questions on hydrogen, oxygen, ozone, &c., followed by a set of general questions on the above, concluding with a collection of papers taken from various examinations, such as the London Matriculation, Science and Art Department, Oxford and Cambridge Locals, &c. Part II. deals with questions on simple and mixed salts and elementary quantitative analysis. The work is one of the "School Examination Series" edited by A. M. M. Stedman, and should prove serviceable to those teaching natural science in many of our schools.

A Course of Easy Arithmetical Examples for Beginners. By J. G. Bradshaw, B.A. (London: Macmillan and Co., 1888.)

This is a very elementary book, suitable for the use of young boys. It consists of a collection of simple arithmetical examples. The first part deals with examples in simple and compound addition, subtraction, multiplication, division, and reduction. Part II., which has been in use for over a year in the Junior School at Clifton, treats entirely of vulgar fractions; Part III., of decimals, practice, and proportion. The various tables used throughout are given at the beginning, and the results of all the examples are collected together at the end.

The Prospector's Hand-book. By J. W. Anderson, M.A., F.R.G.S. Fourth edition. Pp. 145. (London: Crosby Lockwood and Co., 1889.)

The general plan of this book was described on a preceding occasion, so that at present it is only necessary to notice the changes in the new issue. The work, we are told, has been thoroughly revised and enlarged. The enlargement consists of about eight pages of descriptive matter, mainly referring to South Africa; but the results of the thorough revision do not appear to be very considerable. Nearly all the mistakes and ambiguities in the original descriptions of metallic minerals are unchanged. The author calls attention to an addition descriptive of aluminium and its ores, from which we gather that bauxite is a ferruginous clay, a statement that is both original and incorrect. On pp. 94 and 96, one ton is said to contain 29,166 troy ounces, while in the table, on p. 121, 1 per cent., in an assay return, is given as equivalent to 326 ounces 13 dwts. 8 grains per ton. The latter statement is right, the former one is wrong, but the author does not attempt to explain the discrepancy. Perhaps he will do so in the next issue.

H. B.

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